

Airborne Multi-Gas Sensor, Phase II

Completed Technology Project (2015 - 2018)



Project Introduction

Mesa Photonics has developed laser-based gas sensor technology compatible with UAV deployment. Our Airborne MULTI-Gas Sensor (AMUGS) technology is based upon two-tone frequency-modulated spectroscopy (TT-FMS). TT-FMS retains the advantages of near-infrared diode lasers while pushing detection sensitivity more than two orders of magnitude closer to the theoretical limit. Phase I results demonstrated that lightweight, low-power near-infrared systems can deliver sensitivity competitive with mid-infrared gas analyzers. This factor is important for UAV deployment because near-infrared systems that use fiber optic telecommunications components are robust, versatile, and cost-effective. AMUGS uses an open path optical cell that is lighter and more robust than instruments based on cavity-enhanced spectroscopy methods. In, Sensitivity demonstrated in Phase I was a factor of 5-10x better than its nearest competing techniques. Benchtop TT-FMS delivered sensitivities at 10 Hz of 5 ppm for CO₂ and 12 ppb for CH₄. Precision improved to 1.5 ppm for CO₂ and 3.3 ppb for CH₄ with 1 sec of signal averaging. The Phase II target is to design and build a flight-ready TT-FMS prototype that maintains or exceeds this benchtop detection precision. The AMUGS prototype will meet 5 kg and 50 W targets and will be flown on an all-electric model aircraft at the University of Texas at Dallas. This airborne testing will provide critical information that will help further development and commercialization of the AMUGS technology.

Primary U.S. Work Locations and Key Partners

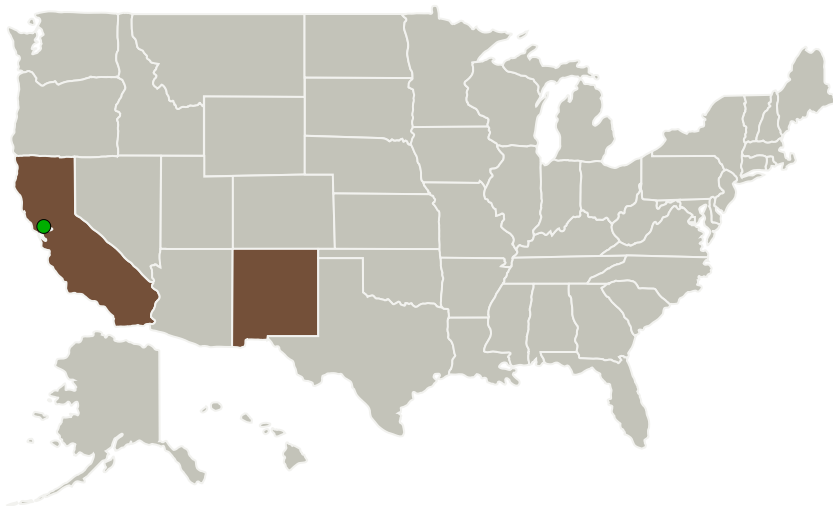
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Phase II

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Organizations Performing Work	Role	Type	Location
Mesa Photonics, LLC	Lead Organization	Industry	Santa Fe, New Mexico
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	New Mexico

Project Transitions

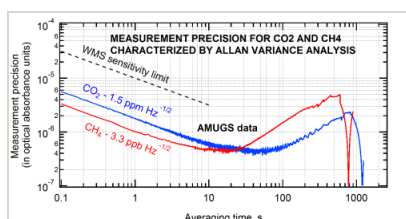
▶ **May 2015:** Project Start

✓ **July 2018:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137788>)

Images



Briefing Chart

Airborne Multi-Gas Sensor Briefing Chart

(<https://techport.nasa.gov/image/133151>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mesa Photonics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

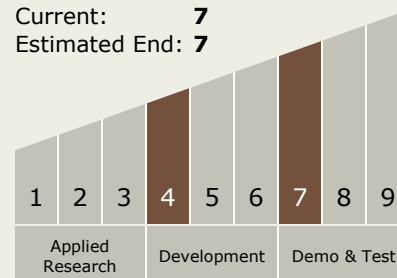
Marwood Ediger

Technology Maturity (TRL)

Start: **4**

Current: **7**

Estimated End: **7**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System